METRObility optical systems

Simply Brilliant Optical Ethernet

Radiance 10/100Mbps Services Line Cards

Managed Network Interface Device (NID) for Ethernet in the First Mile (EFM)

The R821Services Line Card is supported in Metrobility's R5000, R1000, R400 and R200 (shown) platforms.

- *Optical Ehternet Intelligent Demarcation*
- *Advanced VLAN Aware Bridging*
- *Q-in-Q VLAN Tagging*
- *Traffic Prioritization*
- *Bandwidth Provisioning and Rate Limiting*
- *Patent-pending Logical Services Loopback*
- *Copper Line Quality*
- *SFP Optics Support CWDM and BWDM Options*

Metrobility's Radiance Services Line Card provides an intelligent optical Ethernet demarcation point for service providers who are deploying Ethernet in the First Mile. As a carrier-class device, the Services Line Card enables multi-user, multi-service delivery across a provisioning framework. Applications are prioritized over different traffic-engineered paths; multi-level operations, administration and maintenance (OAM) is used to measure and ensure provisioned SLAs; and embedded security controls ensure protection against denial-of-service attacks.

The Radiance Ethernet Services Line Card offers multiple management schemes to provide service providers with a choice of direct internet-standard management using SNMP or IEEE 802.3ah, or a more robust, secure, scalable and flexible proxy-based management through Metrobility's NetBeacon Element Manager.

Transport OAM via IEEE 802.3ah

The IEEE 802.3ah OAM protocol is used to provide proactive health and status information on individual links. Transport OAM management features provide in-service loopbacks for transparent service monitoring, MIB statistics, errored frame events, and "Dying Gasp" capabilities.

Metrobility offers extensions to the IEEE standard to provide monitoring of optical amplitude, line card voltage and power, equipment temperature, rate limiting and RMON statistics. The Services Line Card will respond to these vendor-specific requests from another 802.3ah device that would proxy to an EMS System. Since the device has no IP address, the device is less vulnerable to denial of service attacks than traditional IP-based management such as PING and SNMP and prevents against the propogation of management IP addresses.

Interconnectivity OAM via SNMP and PING

Metrobility utilizes standards-based frameworks and protocols to provision and manage the E-Services NID. This approach enables service providers to use any off-the-shelf management system to manage the NID as an independent network element with its own IP address by using SNMP, Telnet/CLI, and IP PING.

The E-Services NID may be assigned an IP address, or it may be obtained dynamically through DHCP or using 'zeroconf.' A set of MIB-II and Metrobility-specific managed objects are accessible by and available to any SNMP-based management stations over UDP/IP.

Services OAM

Advanced Layer 2 networking allows service providers total flexibility in the deployment, provisioning and delivery of Ethernet services. With configurable traffic transparency, including single and double VLAN-tagged Ethernet frames, support for four service classes, and dynamic bandwidth allocation of ingress and egress traffic, the E-Services NID offers both traffic control and security at the customer edge.

Metrobility offers the ability to verify service delivery by sending a patent-pending, service-specific loopback called the logical services loopback (LSL) which loops back specific frames based on a well-known destination MAC address.

With the logical services loopback, service providers can monitor devices for reachability, class of service agreements, round trip delay and delay variation across VLANs and different service classes.

The embedded software is field-upgradable to ensure support of new features as standards evolve. Remote downloads may be accomplished via TFTP and CLI over Telnet allows remote provisioning.

The Metrobility® Difference

Flexible, user-selectable, multi-level management options

Intelligent management access control makes the device impervious to denial of service

Loopback testing:

- Copper loopback
- OAM optical loopback
- Patent-pending Logical Services Loopback enable end-to-end service level verification

Extensions to 802.3ah OAM

- Real-time statistics to enable Quality of Line monitoring
- Remote real-time monitoring of optical power budgets

Copper Line Quality verifies customer-facing link

History database of power, temperature, optical budgets

Full signal retiming, reshaping, and reamplification (3Rs)

NEBS Level 3 certified

Product Highlights

Supported distances up to 100km

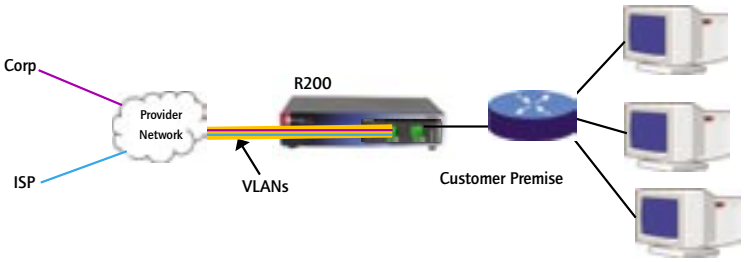
Line rate forwarding

Copper port supports 10/100Mbps auto-negotiation

Secure console port provides local access for configuration

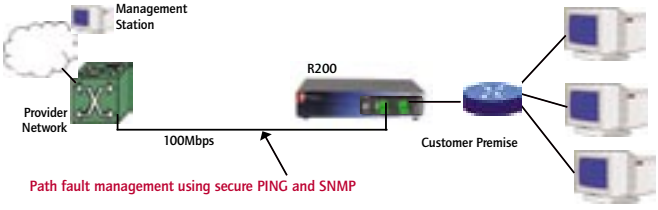
Configurations

Standards-based Multi-service Delivery



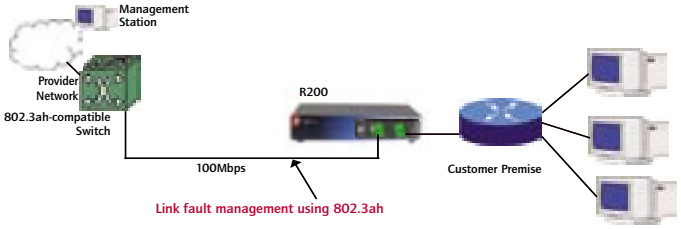
The Services Line Card supports delivery of Metro Ethernet Forum (MEF) -defined point-to-point E-Line and multi-point E-LAN services. Traffic belonging to each service is classified by, and tunneled over, pre-determined VLANs for segregation and transport across carrier networks. Controlled at the Services Line Card, VLANs identify and segregate the specific ISP-access or corporate-access E-Line service, and determine corresponding prioritization and traffic management parameters for the associated traffic. Service provider management traffic is given higher priority than user data traffic.

Direct Internet-Standard Management using IP address of NID at customer site



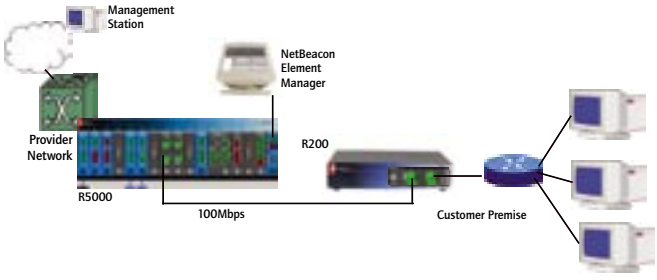
As a NID at the customer premises the R821 Services Line Card is used in one of Metrobility Premises Service Platforms which include the Radiance R1000, R400 or R200. DHCP client functions are enabled on the R821 for obtaining its management (endstation) IP address, network mask, and default gateway for the service provider's network. If a DHCP server is not found, the R821 will use a unique *zeroconf* IP address for initial provisioning. As the CPE demarcation point, the Services Line Card responds to PING requests addressed to unicast and subnet broadcast addresses by delivering information on the health and status of the device and its network connection. SNMP provides Internet-standard management and can be used for surveillance and fault management. Carrier-class management access control protects against denial of service on the management channel.

802.3ah-based NID management



The Services Line Card supports the IEEE 802.3ah standard for operations, administration and maintenance (OAM) of Ethernet in the First Mile (EFM). The EFM/OAM standard enables IP-less remote failure indicators including Dying Gasp, frame level loopback, event notification (errored frame seconds), and MIB polling.

Enhanced remote site management via NetBeacon® Element Manager



The NEBS Level 3-certified Radiance R5000 Central Service Platform installed at the central office or the point of presence connects to the switch or router at service provider's network. As a scalable management point, the R5000 includes a management card which collects information from the Services Line Card which is monitored and managed through NetBeacon Element Manager. This bookend approach provides a graphical view of the device and enables provisioning, quality of line, quality of equipment, optical power, and historical graphs.

Local configuration of NID at customer site

A console port on the front of the Services Line Card provides user-friendly, local access via CLI for provisioning. The port is password-protected to prevent unauthorized access.

NetBeacon® Element Manager

NetBeacon chassis view

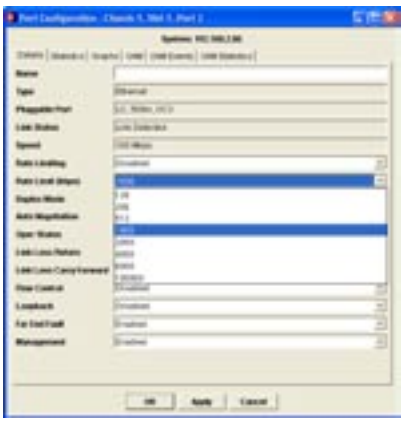
Metrobility's NetBeacon Element Manager is a carrier-class element management framework that consists of a GUI-based element management system and an element management proxy to achieve the highest level of manageability. NetBeacon provides intuitive, graphical management of up to 109 remote sites using a single IP address creating a robust and secure management scheme which improves performance through IP and managed object aggregation. Because an IP address is not required at every access point, this solution scales extremely well for a large metro access service deployment which otherwise would require the management of countless IP addresses.

Using NetBeacon, network managers can access each device remotely, adjust operating parameters quickly and even switch hardware settings across the network. All configuration updates, maintenance, and diagnostics can be performed remotely. Data may be collected for up to 28 days to provide a histogram of RMON statistics, optical transmit and receive levels, power supply levels, voltage levels, and temperature. NetBeacon collects statistics from the Services Line Card in the R5000 chassis in the central office and at the remote site.

Quality of Optical Amplitude: Realtime measurement of the receive and transmit levels of the optical transceivers. Acts as integral power meter.

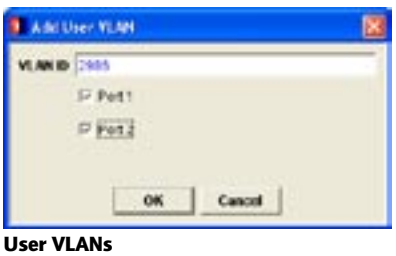
Quality of Equipment Monitoring: NetBeacon monitors the temperature of the board along with the current readings for components and input power source for the services line card. Each monitor has a warning threshold and an alarm threshold to indicate when the level is too high or low. To prevent a potential problem, a trap can be set so an alarm is sent to the network manager if any threshold is crossed.

OAM & CLQ



Rate Limiting

Logical Services Loopback



User VLANs

Database provides a history of up to 28 days for power, temperature, voltage, optical power, and RMON Group 1 statistics.

Fast Ethernet Services Line Cards

Model #	Port 1	Port 2	Max. Supported Segment Length* Port 1	Port 2
R821-1S	10/100BASE-TX RJ-45	100BASE-FX SFP Optic	100m	see optics

R800-CA Services Line Card Console Cable

*Actual segment length is dependent on the quality of fiber cable plant and loss budget of each device. See manual for cable type and product specifications.

SFP Optics

O280-M2	100M LC multimode	2km
O283-20	LC singlemode	20km
O281-40	100M LC singlemode	40km
O281-80	100M LC singlemode	100km
O293-20	LC singlemode	20km
O383-20-31	BWDM LC singlemode	20km
O383-20-55	BWDM LC singlemode	20km

CWDM 80km**

O483-80-47	LC	1470nm
O483-80-49	LC	1490nm
O483-80-51	LC	1510nm
O483-80-53	LC	1530nm
O483-80-55	LC	1550nm
O483-80-57	LC	1570nm
O483-80-59	LC	1590nm
O483-80-61	LC	1610nm

**For 40km, use O413-40-xx.

Platform Options

R5000-17HS	17-slot chassis two bays for optional AC/DC power supplies
R1000-AAF	2-slot chassis with two front-facing AC power supplies
R1000-AAR	2-slot chassis with two rear-facing AC power supplies
R1000-DDF	2-slot chassis with two front-facing DC power supplies
R1000-DDR	2-slot chassis with two rear-facing DC power supplies
R400-2HS-1A	2-slot chassis with single external AC power supply
R200-AC	1-slot chassis with single internal AC power supply
R200-DC	1-slot chassis with single internal DC power supply

Management

NetBeacon	NetBeacon Element Management Software
R502-M	Management Card (requires 1 slot in the chassis and enables NetBeacon and WebBeacon)

Standards Compliance

- IEEE 802.3-2002
- IEEE 802.3ah OAM
- IEEE 802.1D-1998 Forwarding Aspects
- IEEE 802.1Q-2003 Forwarding and Tagging Aspects
- RFC 768 (UDP)
- RFC 791 (IP)
- RFC 792 (ICMP)
- RFC 793 (TCP)
- RFC 826 (ARP)
- RFC 854 (Telnet)
- RFC 950 (Internet Standard Subnetting Procedure)
- RFC 1157 (SNMPv1)
- RFC 1213 (MIB-II)
- RFC 1349 (IP) – updates RFC 791
- RFC 1350 (TFTP)
- RFC 1782 (TFTP) – updates RFC 1350
- RFC 1783 (TFTP) – updates RFC 1350
- RFC 1784 (TFTP) – updates RFC 1350
- RFC 1785 (TFTP) – updates RFC 1350
- RFC 2011 (MIB-II) – updates RFC 1213
- RFC 2012 (MIB-II) – updates RFC 1213
- RFC 2013 (MIB-II) – updates RFC 1213
- RFC 2131 (DHCP)
- RFC 2347 (TFTP) – updates RFC 1350
- RFC 2348 (TFTP) – updates RFC 1350
- RFC 2349 (TFTP) – updates RFC 1350
- RFC 2674 (Bridge Extensions)
- RFC 2819 (RMON Group 1)
- RFC 2863 (Interfaces Group MIB) - updates RFC 1213
- RFC 2865 (RADIUS)
- RFC 3168 (TCP) – updates RFC 793
- RFC 3273 (RMON Group 1)
- RFC 3396 (DHCP) - updates RFC 2131

MIB-II

The R821 services line card supports the following standard Management Information Base (MIB-II) managed object groups, pertaining only to the endstation traffic.

- System (end-station only)
- Interfaces (end-station and data interfaces)
- IpNetToMedia (end-station only)
- IP (end-station only)
- ICMP (end-station only)
- TCP (end-station only)
- UDP (end-station only)
- SNMP (end-station only)
- AT (end-station only)

Objects from within these MIB groups are accessible by, and available to, SNMP-based management stations over UDP/IP.

Enterprise-Specific Managed Objects

Metrobility-specific managed objects provide control of the following objects:

- End-station IP addressing information
- SNMP access communities
- SNMP trap destination addresses and communities
- Download server addresses
- Download management software
- Interface control (enable/disable)
- Input/output laser levels
- Managed VLAN
- Management Port

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Metrobility Optical Systems is an innovative next generation optical networking company whose focus is on delivering optical access platforms and to harness the power of Ethernet and fiber optics to deliver superior network edge access, connectivity and wavelength multiplexing solutions.

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Specifications

Environmental

Oper. Temp.	0°C to 50°C
Oper. Humidity	5% to 95% non-condensing
Storage Temp.	-25°C to 70°C

Regulatory (Safety/EMC)

UL, CSA, CE, CB
NEBS Level III,
EN60950 (safety)
FCC Part 15 Class B
ICES-003 Class B (emissions)
EN55022 Class B (emissions)
EN55024:1998 (immunity)
IEC 825-1 Classification (eye safety)
Class 1 Laser Product (eye safety)

MADE in USA

A6285 ISO 9001

Metrobility Optical Systems,Inc.